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On Some Pliocene Mammalia from Petite Anse, La.

By E. D. Cope.

(Read before the American Philosophical Society, November 15, 1895.)

The remains of extinct Mammalia from Petite Anse, Louisiana, have been the subject of two brief communications to the Academy of Natural Sciences by Prof. Leidy, 1884, p. 22, and of a longer one in the *Transactions* of the Wagner Free Institute of Science, 1889, p. 33. Mr. H. C. Mercer has published an account of remains of human industry found at the same locality in the *American Naturalist* for 1895, p. 393. His remarks are based partly on a letter from Dr. Joseph M. Joor, M.D., of New Orleans, who made an exploration of the locality in 1890, and furnished a very full report to Mr. Mercer. The specimens were placed in the Museum of the Tulane University, of New Orleans. Through the kindness of President Johnson, of the University, the specimens were submitted to me, and I give in the following pages the result of my examination. Dr. Joor reports the occurrence of an *Equus* and *Myiodon harlanii* (already mentioned by Leidy), and probably some other giant sloths, a small *Mastodon* and possibly an *Elephas*. I can confirm these determinations of Dr. Joor, except as to the *Elephas*, which I have not seen, and about which the doctor was in doubt.

MYLODON HARLANII Owen.

Of this species the collection contains the following teeth: A complete series of superior molars, all separate, the anterior internal lobe of the third, broken off; the second, fourth and fifth of the superior series of the opposite side, all separate; the first, third and fourth of the inferior series, all separate; separate first and third inferior molars.

The positions of the superior molar teeth have been determined by comparison with the corresponding teeth in place of the *Myiodon renidens* Cope, described below; and with the figures of those of the *M. robustus* Owen, given by Owen,* Ameghino† and Lydekker.‡ Leidy has already described and figured the inferior molars.§ In his description Leidy remarks that the superior molars are unknown. I am now able to fill this gap in our knowledge, and to point out some conspicuous characters in which this species differs from the *M. robustus* of Owen. Leidy has described the second superior molar from isolated specimens from Petite Anse, La., and from Missouri, the latter from the type specimens of Harlan's *Orycterotherium missouriense*,|| supposing them to be first upper

* *Memoir on Myiodon robustus* Owen, 1842.

† *Mamm. Foss. Repub. Argent.*, 1889.

‡ *Annales del Museo de la Plata; Paleontologia Argentina*, iii, 1894.

§ *Memoir on the Extinct Sloth Tribe of N. America*, Smithsonian. *Contrib. to Knowledge*, 1853.

|| *Proceeds. Academy Phila.*, 1885, p. 49, Figs. 3-6.

molars. He remarks that these teeth differ so much from the first upper molars of the *M. robustus*, that it may be necessary to refer the *M. harlanii* to a genus distinct from the latter, with Harlan's name *Orycterotherium*. Since, however, the teeth in question are second molars, the difference is not so conspicuous, and generic distinction is not indicated.

The first superior molar is smaller than the others, is more strongly curved, and the section is a wide oval, the inner side much less convex than the external. The second molar is curved slightly backwards and also outwards, and has a rather narrowly oval or subreniform section, since there is a median groove on the inner side, which is more conspicuous in one of the teeth referred to this position than in two others. The anterior and posterior faces are regularly rounded, and show no traces of angulation. The dentine is about equally thick all around. The grinding surface is worn into two oblique surfaces; the anterior longer and steeper, for the first inferior molar; the posterior shorter, for the anterior face of the apex of the second lower molar. The teeth have very much the form and size of that one described by Leidy as representing his *Megalonyx dissimilis*, but the beveling of the grinding face, and the equal thickness of the dentine on the inner side, show that the species, at least, are distinct.

The third superior molar is bilobed on the interior side, the posterior lobe being rather narrow; and the external outline is rather narrowly rounded, and is not truncate. The posteroexternal face is shallowly grooved and concave. The long axis is very oblique to that of the jaw. This tooth in the *M. robustus* has the posteroexternal face convex, and the posterointernal lobe is not so narrow; the axis is very oblique. In the *M. renidens* it is more different, having the section reniform with the long axis nearly anteroposterior. The fourth superior molar has also a bilobate outline on the internal side, the posterior lobe more produced than the anterior. The crown is quite narrow anteroposteriorly, and the external outline is narrowly truncate. It is represented as rounded in the *M. robustus*. It has a greater anteroposterior diameter in the *M. renidens*, and the anterior face is separated from the rounded posteroexternal by an angle. In both of the North American species the groove of the interior face is deeper than is represented to be the case in the *M. robustus*. The last superior molar is much like that of *M. robustus*.

The specific difference which distinguishes the *M. harlanii* most conspicuously from the *M. robustus* is then the form of the second superior molar. This tooth is much larger in the former, and has an elongate subreniform section, while in the *M. robustus* the section is round. The third and fourth superior molars also are rather narrower in anteroposterior diameter in the *M. harlanii*.

It is unnecessary to describe the inferior molars, as this has been already done by Leidy. The resemblance to those of the *M. robustus* is quite close.

Measurements of Superior Molars.

MM.

Diameters of m. i	anteroposterior	20
	transverse	15
Diameters of m. ii	longitudinal	83
	anteroposterior	30
	transverse	15
Long (oblique) diameter of m. iii.	33
“ “ “ “ m. iv	31
Diameter do. at right angles to the longest.	17
Diameters of m. v	longitudinal	70
	anteroposterior	30
	transverse (longest)	25

MYLODON RENIDENS Cope, sp. nov.

This species is founded on a right maxillary bone, which contains all but the first molar tooth. This tooth is represented by an alveolus broken anteriorly, and the free portions of the crowns of the second and third molars are broken off. The crowns of the fourth and fifth molars are perfect. Associated with this specimen are the following, which probably belong to the same species: The posterior three molar teeth of the inferior series; a superior first molar in place in the anterior part of a right maxillary bone.

The superior and inferior series referred to are considerably smaller than the corresponding parts of the *M. harlanii*, and might be supposed to have belonged to young individuals. As these animals are, however, monophyodont, it is evident that the only way in which a permanent dentition could be adapted to a growing jaw is by the appearance of but a part of the dentition at a time, or by a conical form of tooth crown, which will permit of the expansion of each tooth at the base. This mode of enlargement does exist for a short time among the Bruta, and this is exhibited in the teeth of the species called *Sphenodon* by Lund, and *Megalonyx sphenodon* * by myself. The wider base is visible in the inferior series of *Myiodon renidens* in this collection, but the largest dimensions thus obtained are much below those of the *M. harlanii*. The superior molars display little if any expansion at the basis of the roots. The crowns of both superior and inferior molars are worn. The presence of a third inferior molar of a species of much larger size, but of the same peculiar character as that of the smaller series, shows that the character is constant and significant.

The typical specimen consists of almost the entire right maxillary bone, with the teeth in place as above described. The alveolus for the first molar indicates that the latter has a subcylindric shaft, curved slightly posteriorly at the extremities. The second molar has a rather narrowly oval section, with a very slight concavity on the inner side, the long axis

* *Proceeds Amer. Philos. Soc.*, 1871, p. 83.

directed a little inwards anteriorly if truly anteroposteriorly. Dentine equally thick all round. Extremities of section regularly rounded. This tooth is like the corresponding one of the *M. harlanii*, and with a greater anteroposterior diameter than in the *M. robustus*. The third molar is reniform in section, wider anteriorly than posteriorly, the long diameter directed a little outwards anteriorly from strictly longitudinal. The posterior lobe is narrower than the anterior measured transversely, and neither lobe is flattened or truncate at any point. There are two longitudinal shallow grooves of the shaft; one submedian interior, the other opposite to it, presenting outwards and backwards at an angle of 45° to the axis of the jaw. This tooth is quite different in form from the corresponding one in the *M. robustus* and *M. harlanii*, in its relatively much greater anteroposterior diameter, approaching in this respect the form of the second superior molar.

The fourth superior molar has a subtriangular section, the apex external and rounded, and the base internal and bilobate. The posteroexternal face is slightly concave, and the anterior face is flat. Its anteroposterior diameter is relatively greater than in the *M. harlanii*, agreeing in this respect with the *M. robustus*. It is thus evident that the third and fourth superior molars of the *M. renidens* are of very different shape, while in the *M. robustus* they are much alike. The fifth and last superior molar is much like that of the other two species. It is widened anteriorly, and narrowed posteriorly, the anterior long diameter being 45° to that of the jaw. A shallow groove of the shaft both externally and internally. The area of the grinding face is less than that of the fourth molar.

The infraorbital foramen issues opposite the anterior half of the third superior molar. The anterior border of the zygomatic foramen is opposite the anterior border of the m. 5. The palate is roughened with low ridges and tuberosities. The difference between its anterior and posterior diameters is not nearly so great as in the *M. robustus*, since the dental series is only slightly divergent forwards from the median palatal suture.

Measurements of Superior Dentition.

	MM.
Length of maxillary bone on palate	128
Palatal width of maxillary at m. i.	35
" " " at m. iv.	26
Diameters of m. ii { anteroposterior.....	23
{ transverse.....	11.5
Diameters of m. iii { anteroposterior.....	21
{ transverse at middle.....	12
Diameters of m. iv { anteroposterior (internal).....	15
{ transverse (anterior).....	15
Diameters of m. v { anteroposterior.....	16
{ transverse (45° to long axis).....	14

A fragment from the anterior extremity of the right maxillary bone of another specimen contains the first molar. The bone does not extend

anterior to the tooth more than the long diameter of the latter. The premaxillary suture commences in front of the tooth, and not internal to it, as is represented to be the case in the *M. robustus*. The section of the crown is a wide oval, the inner side a little more convex than the outer. Dentine thick and equally so all round. Diameters: anteroposterior, 16 mm.; transverse, 12 mm. The grinding face is nearly horizontal. As it is quite oblique in the *M. harlanii*, and on account of the smaller size, I refer this fragment provisionally to the *M. renidens*.

Three inferior molars, which correspond in size with the *M. renidens*, are provisionally referred to it; especially as the third presents characters quite distinct from those of the *M. harlanii*. The first tooth is not preserved. The second is like the corresponding tooth in the two larger species. The section is trilobate, the narrowest and most distinct lobe directed posterointernally; the long axis of the two other lobes, which are less distinct from each other, at 45° with that of the jaw. The grinding surface of the two anterior lobes is directed obliquely forwards, and that of the posterointernal lobe obliquely backwards, for contact with the second and third superior molars.

The third inferior molar exhibits externally the outlines of a parallelogram with rounded angles, in its cross-section, as in the other species, but the inner extremity is different. The internal border is oblique, and not parallel to the external border, owing to the fact that the anterior internal angle is much exterior in position to the posterior internal angle, from which it is separated by a shallow concavity which presents forwards and inwards, as the section of a groove of the shaft, which is wanting in the two larger species. The anterior and posterior faces present each an open shallow median groove.

The last inferior molar does not differ in form from that of the *M. harlanii* and *M. robustus*.

Measurements of Inferior Molars.

MM.

Diameters of m. ii	{	longitudinal.....	46
		anteroposterior, 45°	18
		transverse, 45°	15
Diameters of m. iii	{	longitudinal.....	58
		anteroposterior, 45°	11
		transverse, 45°	19
Diameters of m. iv	{	longitudinal.....	60
		anteroposterior.....	26
		transverse.. { least.....	7
		{ greatest, 45°	19

MYLODON SULCIDENS, sp. nov.

This species is represented by a penultimate inferior molar of a species of the size of the *M. harlanii*. Accompanying the remains of the two species are two penultimate superior molars of opposite sides, which I

suspect to belong to the *M. sulcidens*, as they differ from the corresponding teeth of the *M. harlanii* in the same way as the penultimate inferior molar.

The penultimate inferior molar resembles closely that of the *M. renidens*, but has the dimensions of the *M. harlanii*. The internal extremity of the crown is beveled on the posterior border, so that an obtuse ridge characterizes the posterior side of the crown, which is separated from the posterior border of the external face. The latter is subtruncate.

<i>Dimensions.</i>		MM.
Diameters	longitudinal	73
	transverse (oblique)	27
	anteroposterior (in axis of jaw)	20

The penultimate superior molars look as though they belonged to the same individual, they so exactly agree. Their long diameter is obliquely transverse to the maxillary bone, and the internal face is deeply grooved as in other species of the genus, the anterior ridge being much less prominent than the posterior. The character which distinguishes the tooth from that of the other species is that the external aspect instead of being regularly rounded is obliquely beveled posteriorly so as to produce an obtuse angle on the posterior side within the posterior margin. This is separated from the posterior internal rib by a shallow concavity. When the tooth is held obliquely, as it was in the jaw, the external bevel is parallel with a line connecting the two internal ribs or borders.

Diameters of penultimate m. iv	transverse	26
	longest oblique	33
	anteroposterior	16

EQUUS INTERMEDIUS, sp. nov. *Equus major* Leidy, *Transac. Wagner Free Inst. Science*, ii, 1889, p. 38; (not of Dekay).

Prof. Leidy described and figured as above cited a number of teeth of horses from Petite Anse now in the collection of the United States National Museum. He refers them to the *Equus major*. They agree in general with the teeth contained in the collection from Tulane University, and, I think, cannot be identified with that species. The collection before me includes a dozen superior molars of adult animals referable to five individuals. Of these, five belong to the maxillary bone of one individual, and two to the opposite side of another individual. There are several superior molars of immature individuals, and numerous inferior molars of adult and young animals, and a few deciduous molars. Accompanying these are a symphysis mandibuli, with all the incisors in place, together with a number of loose incisors. To these must be added numerous bones from all parts of the skeleton, in good preservation.

The molar teeth are as large as those of the *E. major*, and large forms of the common horse. The enamel folds are less complex than those of the former, but are more complex than is usual in the *E. caballus*, though specimens of the latter can be found to match them. They are consider-

ably more complex than in the *E. occidentalis*. The internal anterior column or protocone is remarkable for its great anteroposterior diameter in the premolars as well as in the true molars, although in some of the specimens figured by Leidy (*l. c.*) those of the p.m. ii and iii are not so well marked in this respect as those in the specimens now described. In the *E. occidentalis*, while this diameter is large in the true molars, it is reduced in the premolars as it is in the *E. caballus*. When the cementum is wanting on the inferior molars, the surface of the dentine is seen to be marked by fine longitudinal grooves.

In the symphysis mandibuli preserved, the incisors are all present. Their crowns all have considerably greater absolute and relative transverse diameters than those of the *E. caballus*, and the posterior cingulum is present except in the external incisor, where no trace of it exists. I have not observed this in the horse, but the inner wall of the cup is sometimes imperfect in the quagga. In the loose incisors preserved, which are less worn than those in the symphysis, the internal wall of the cup is not so well developed as in *E. caballus* and *E. occidentalis*. Thus in four teeth it is notched at the middle, and in two external teeth it has a wide interruption, extending to the fundus in one, and nearly to the fundus in the other. In this respect these teeth approach those of the *E. fraternus*.

The last superior molar has a greater anteroposterior diameter than usual, considerably exceeding that of the penultimate. Three such molars display this peculiarity.

In the characters of its molar teeth then this species is intermediate between the *E. major* and *E. occidentalis*, and in the character of its incisors it approaches *E. fraternus*. In order to learn more exactly of its affinities it is necessary to make some comparisons with other portions of the skeleton. For this purpose, among other parts, the occipital region of one individual is available.

This region differs from the corresponding part of the *E. caballus*, and agrees in most respects with that of *E. occidentalis*.* A transverse crest connects the paroccipital processes and the basisphenoid, bounding the precondylar fossa in front, so as to convert it into a basin. In *E. caballus* and *E. quagga* this transverse crest does not exist, so that the fossa opens directly anteriorly. The basisphenoid is not compressed as in *E. caballus*, but is wide and robust, and the inferior face is marked by a wide median groove. I have seen nothing like this in a true horse, but the form is that of the *E. occidentalis*, where, however, there is no groove. There is a longitudinal angle on each side of the sphenoid in the *E. occidentalis*, which is wanting in *E. caballus*, but of which a trace may be seen in the *E. fraternus*. The condylar foramen in *E. fraternus* is more anterior than in *E. caballus*, though this character will probably prove to be less constant than the others mentioned.

The *E. intermedius* is a shorter-nosed species than the *E. caballus*, the distance from the anterior lower premolar forwards only equaling the

* *Proceeds. Amer. Philos. Soc.*, 1884, p. 11.

corresponding length in the quagga, while the parts are in other respects as large as those of the domestic horse. The maxillary bone is produced posteriorly to the last molar as far as in *E. caballus*. In *E. occidentalis* this distance is less. The last superior molar is larger than the penultimate in *E. intermedius*; it is equal or larger in *E. caballus*, while it is smaller in *E. occidentalis*.* In the *E. occidentalis* figured by Leidy (Exot. Mamm. Dak. Nebr. Pl. xxi), and in the one figured by me (Ann. Rept. Geol. Surv. Tex. 1892), the palatine foramen is opposite the penultimate molar. In the *E. intermedius* as in the *E. caballus* it is opposite the last molar. In the symphysis the mental foramen is entirely anterior to its posterior border, as in *E. occidentalis*. This specimen belonged to a mare, as it has no trace of canine tooth, the first time that I have observed this character in an extinct North American horse.

The *Equus intermedius* is then intermediate between the *E. occidentalis* and the *E. caballus*. It agrees with the latter in its molars and palatine foramen; with the former in the occipital region, wide incisors and short muzzle, and tends towards *E. fraternus* in the incisor cups. From *E. major* it differs in the much less complex enamel folds.

<i>Measurements.</i>	<i>MM.</i>
Length of last five superior molars	143
" " true molars	86
Diameters of p. m. ii { anteroposterior	30
{ transverse	31
Diameters of m. i. . . { anteroposterior	25
{ transverse	30
Diameters of m. iii. . { anteroposterior	36
{ transverse	29
Length of maxillary bone posterior to m. iii.	40
" " mandible from p. m. iii to external border of incisors	130
Width at middle of symphysis above	34
" " base of I 3	63
Transverse diameter of crown of I 2	21
Anteroposterior diameter of crown of I 2	10
Transverse diameter foramen magnum	14
" " occipital condyles	92
Anteroposterior diameter occipital condyles above	50

SUPPLEMENTARY NOTE ON EQUUS FRATERNUS LEIDY.

EQUUS FRATERNUS Leidy, *Proceeds. Phila. Acad.*, 1858, p. 11; *Postpliocene Fossils of S. Carolina*, Tuomey and Holmes, 1859, p. 100, Pl. xv Figs. 6, 8, 16, 17, 18; Pl. xvi, Figs. 23, 27-29.

This species is represented by a considerable number of teeth together

* See *Ann. Report Geol. Survey of Texas*, 1892, Plate xxii, Fig. 3.

with part of a lower jaw with symphysis, in the museum of the Wagner Free Institute of Science, of Philadelphia.

Leidy remarks of this species that it is not possible to distinguish it from the *E. caballus* by the teeth, and he has not offered any other characters by which to distinguish it. I was therefore compelled to omit mention of it from my table of the American species of *Equus*, published in the *Proceeds. American Philos. Society*, 1894, p. 10, and *Annual Report of the Geological Survey of Texas* for 1892, "Vertebrate Paleontology," p. 66. Subsequently I had the opportunity of examining the dentition and mandible of a horse from Florida, determined by Leidy as the *E. fraternus* and preserved in the museum of the Wagner Free Institute of Science of Philadelphia. One set of dentition belonged to a young horse and the other to an adult. In both the posterior wall of the cup of the incisor teeth is extensively interrupted, so as to reduce the triturating surface to a single crescent. On account of this character I proposed to refer the species to a distinct genus, which I called *Tomolabis*, regarding it as a degenerate offshoot of the genus *Equus*. A reëxamination of the specimens together with the observations above recorded on the incisors of the *E. intermedius*, suggests that an examination of a larger amount of material will be desirable before the validity of this genus can be established, since it is possible that a full series of gradations between the characters of the incisors in *E. fraternus* and *E. intermedius* may be established.

It is demonstrated by the specimens in the Wagner Free Institute that there existed in Florida during probably Pliocene time, a species of horse of considerably smaller size than either the *E. major*, *E. intermedius* or *E. occidentalis*, and characterized by an enamel plication of the molars similar to that of the *E. intermedius*, that is, generally a little more complex than is characteristic of the *E. caballus*. What characterizes it especially is the small size of the protocone, which has an anteroposterior diameter considerably less than in the species named, not differing much, however, from some specimens of the common horse. Thus this measurement enters the anteroposterior diameter of the grinding surface 2.5 times, rarely twice and one-third times, and in one instance only, twice. In the true molars of *E. intermedius*, *E. occidentalis* and *E. major* the proportion of the two diameters is 1 to 1.5 in the great majority of teeth. This peculiarity with that of the incisors indicates, I think, that this horse must be regarded as a distinct species or race.

The part of the mandible referred to contains all the incisors, and the second and third molars of the left side. The latter teeth agree with the largest separate teeth of the collection in characters. The length of the jaw anterior to the p. m. iii is equal to that of the corresponding part of the *E. intermedius* and is considerably shorter than in the *E. caballus*. It must be borne in mind that the molars are smaller than in the ordinary *Equus caballus*, so that this dimension is relatively longer than in the *E. intermedius*. Appropriately the symphysis is not so wide at the external incisors as in the latter, and is less contracted at the posterior part of

DESCRIPTION OF PLATES.

All the specimens figured are the property of the Tulane University.

PLATE X.

Fig. 1. Superior molars of *Mylodon harlanii* Ow., from separate teeth ; nat. size, from below.

Fig. 2. *Mylodon harlanii* Ow., grinding face of inferior m. iii from above.

Fig. 3. *Mylodon renidens* Cope, maxillary bone with teeth, from below.

Fig. 4. *Mylodon sulcidens* Cope ; Inferior molar iii profile ; a from above.

PLATE XI.

Fig. 5. *Mylodon renidens* Cope ; a, b, c, Inferior molars ii, iii and iv from above.

Fig. 6. *Mylodon renidens* Cope ; third inferior molar.

Fig. 7. *Mylodon sulcidens* Cope ; a, superior m. iv from below ; b, superior m. iv from inner side.

Fig. 8. *Equus intermedius* Cope, last five superior molars from below ; nat. size ; with posterior extremity of maxillary bone.

PLATE XII.

Fig. 9. *Equus intermedius* Cope ; Symphysis mandibuli from above ; nat. size.

Fig. 10. *Equus intermedius* Cope, basioccipital and part of the basisphenoid and adjacent regions ; nat. size.

An Early Essay on Proportional Representation.

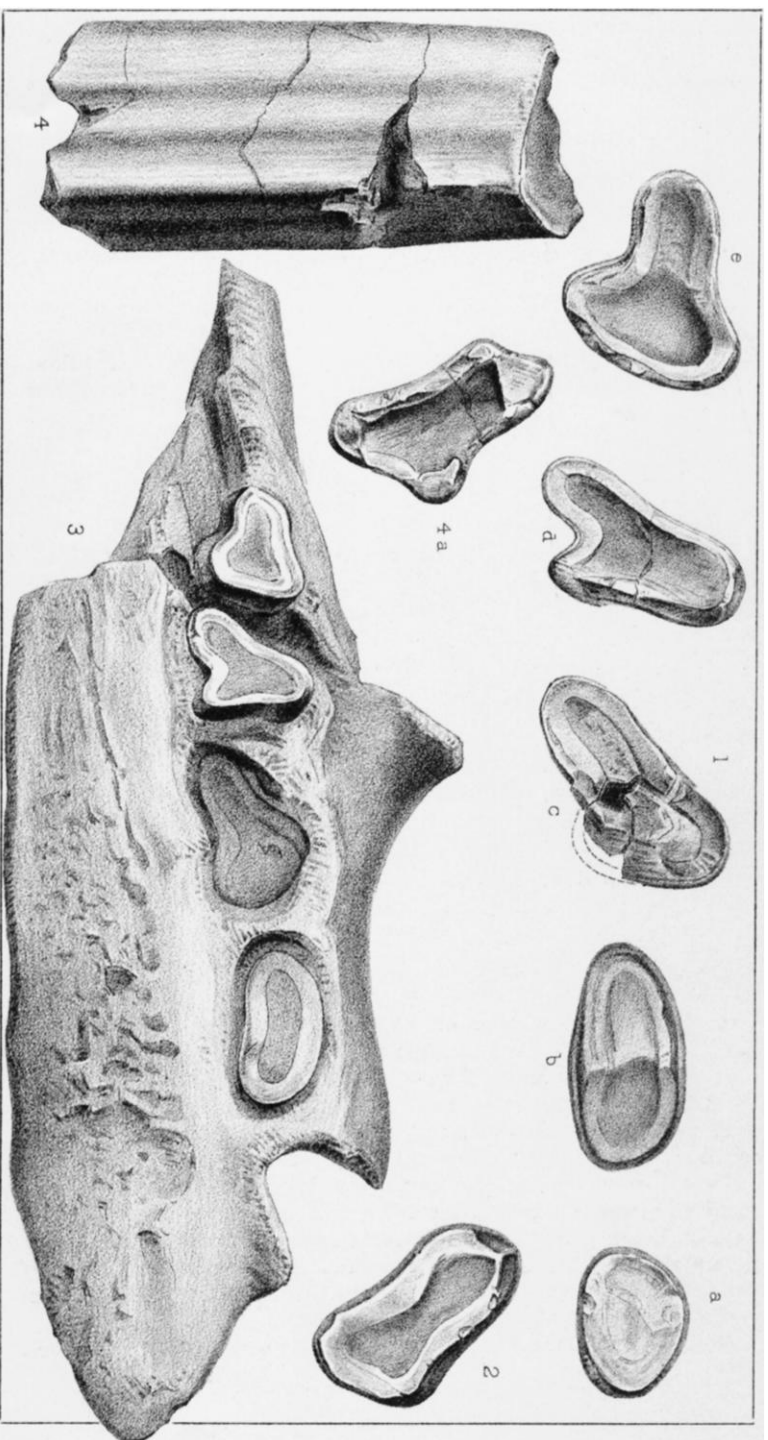
By Edmund J. James.

(Read before the American Philosophical Society, December 6, 1895.)

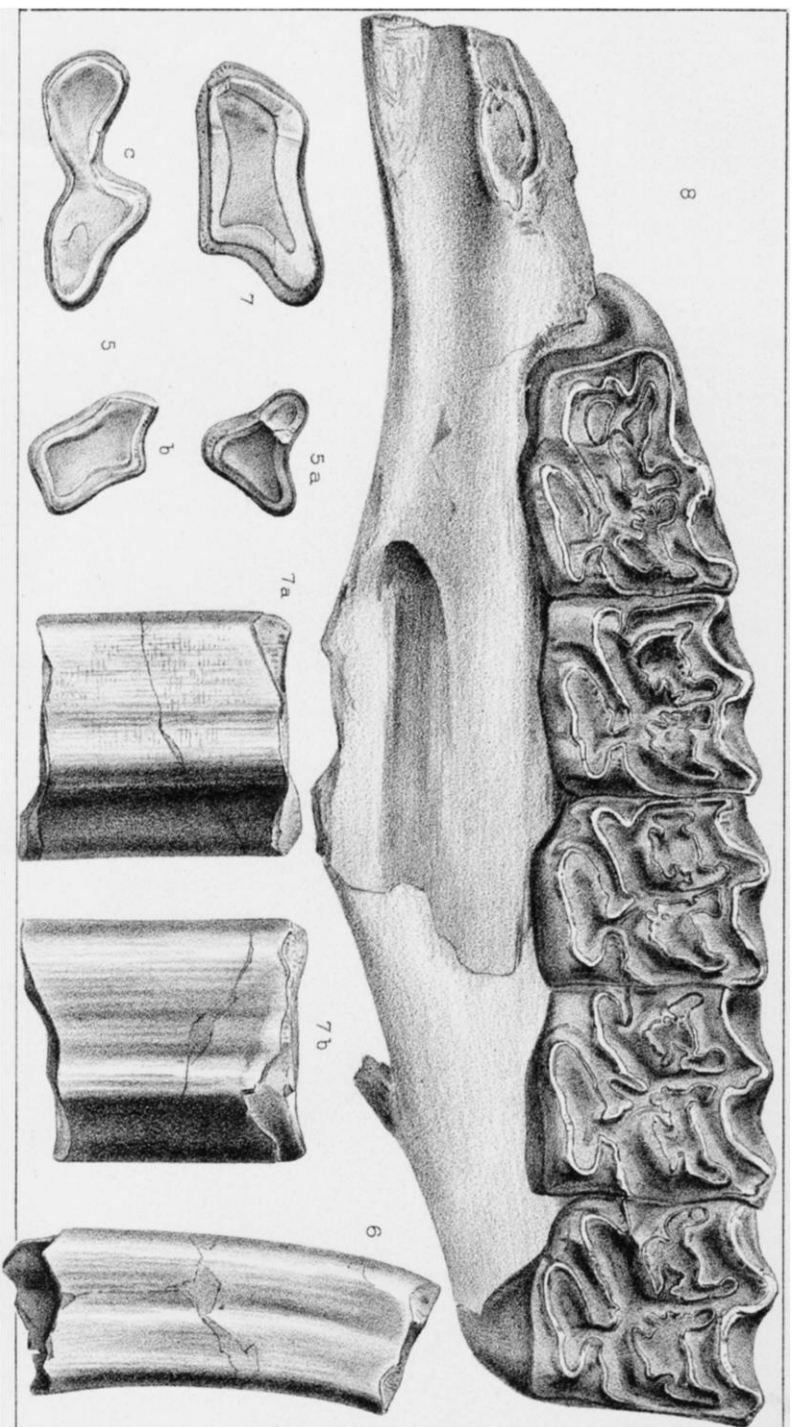
On May 3, 1844, the American Philosophical Society, of Philadelphia, gave Thomas Gilpin, Esq., permission to read a printed paper, entitled, "On the Representation of Minorities of Electors to Act with the Majority in Elected Assemblies." The paper had been printed by the author at his own expense and dedicated to the Society. The date at the end of the paper is May 1, 1844 ; in the dedication May 3, 1844.

Two copies of the pamphlet are in the Philadelphia Library ; one is reported to be in the Boston Athenæum Library ; one is in the Harvard College Library ; one in the Franklin Institute Library ; one in the library of James Monaghan, of West Chester, and there are probably also copies in other libraries. It is a small pamphlet of fifteen pages and was reprinted in the *Penn Monthly* in 1872.

This paper is remarkable as being one of the first systematic discussions



1-2. MYLODON HARLANI OW. 3. M. RENIDENS COPE. 4. M. SULCIDENS COPE.



5-6. MYLODON RENIDENS COPE. 7. M. SULCIDENS COPE. 8. EQUUS INTERMEDIUS COPE.

